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ABSTRACT

The objectives of this program developed by the Computer Literacy Planning Group of the District of Columbia Public Schools are to: (1) develop computer awareness among students, teachers, supervisors, and administrators; (2) develop and implement a computer literacy curriculum; (3) design and implement a computer training laboratory; (4) apply computer technology in the local school implementation of the competency-based curriculum through drill and practice, tutorials, problem solving, simulations, and other appropriate techniques; (5) apply computer technology in classroom management, including record keeping, and tracking and reporting of student progress; and (6) apply computer technology to local school management. Computer hardware and software will be acquired for each school, and training will be offered for instructional and management staffs. Individual chapters of this report focus on the areas identified by the group for study of programmatic and policy implications; where appropriate, recommendations and policy considerations are stated. These areas include goal, definition, desired learning outcomes, instructional computing, software, hardware, maintenance, existing programs, interactive technologies, computer training laboratory, job descriptions, and interaction with others. (LMM)

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COMPUTER LITERACY

FIVE YEAR PLAN

SY 1983-1987

Volume I

District of Columbia Public Schools
Washington, D.C.
September 1982

IR010676

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DISTRICT OF COLUMBIA PUBLIC SCHOOLS
COMPUTER LITERACY PROGRAM

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VOLUME II

TECHNICAL SPECIFICATIONS FOR HARDWARE AND SOFTWARE, AND MAINTENANCE IN SUPPORT OF COMPUTER LITERACY PROGRAM

I. INTRODUCTION

The mission of the District of Columbia Public Schools is "...to promote excellence by providing a viable and comprehensive instructional program (pre-kindergarten through twelfth grade) leading to the attainment of knowledge, competencies, and skills which upon completion will enable each student to function as a useful citizen." While the mission of the school system need not change, the strategies used to successfully accomplish the mission must be updated.

The continuing development of new technologies, especially of computers, is revolutionizing American society. The impact of computers spans age, economic, and ethnic lines. In the District of Columbia, with its heavy concentration of white collar industry, computers are used in businesses to manage data and information; as communication devices they link us with the rest of the country and the world. The Federal and District governments, the major local employers, along with their counterparts in the private sector, are now requiring some degree of computer literacy for many positions that are becoming available. Even during times of high unemployment, the local newspapers carry page after page of advertised positions requiring computer skills.

Our students, as consumers, have felt the impact of computer technology. When making purchases, they have seen electronic scanners "read" product labels without understanding the intricate nature of the transaction. At home, their parents receive computerized utility, telephone, and credit card bills. Clearly, the need for some degree of computer literacy has become necessary "to function as a useful citizen."

In response to this changing environment, the District of Columbia Public Schools is developing a systemwide Computer Literacy Program. The program, proposed to be implemented over the next five years, will require major investments of staff, time, and resources.

The objectives are:

- To develop computer awareness among students, teachers, supervisors, and administrators
- To develop and implement a computer literacy curriculum
- To design and implement a Computer Training Laboratory
- To apply computer technology in the local school implementation of the Competency-Based Curriculum through drill and practice, tutorials, problem solving, simulations, and other appropriate techniques
- To apply computer technology in classroom management, including record keeping, tracking of student progress, and reporting student progress
- To apply computer technology to local school management.

Computer hardware and software will be acquired for each school, and instructional and management staffs will be offered training. This major effort recognizes that the "competencies and skills" needed in the 1980's will not necessarily be sufficient in the next decade or the next century.

The Computer Literacy Planning Group identified areas in which to study various aspects of a comprehensive computer literacy program. These areas include:

- Goal
- Definition
- Desired Learning Outcomes
- Instructional Computing
- Software
- Hardware
- Maintenance
- Existing Programs
- Interactive Technologies
- Computer Training Laboratory
- Job Descriptions
- Interaction With Other Groups

While taking into account related problems, each area has been studied for programmatic and policy implications and, where appropriate, recommendations and policy considerations stated.

Recognizing that staff training is essential to the success of the program, a key element of the Computer Literacy Program will be a Computer Literacy Training Laboratory. Approximately four hundred (400) administrators, teachers and other instructional personnel on elementary and junior high school levels, participated in the Computer Literacy Training cycles beginning in July, 1982 and ending in August, 1982. Additional training cycles will be conducted during SY 1982-83 and will include senior high school personnel. In subsequent years, additional personnel from all levels will be trained and special needs addressed.

The computer literacy thrust over the next five years will have to adapt, in part, to other technological developments. For example, within two years, all schools may be connected to a citywide cable television network. In addition, videodisc technology and internal/external audio and audio-visual teleconferencing will play a role in determining how computers and other interactive technologies are used to educate students.

Computer technology is rapidly changing with newer, cheaper, and more versatile equipment entering the market each month. Fiscal prudence requires that computer hardware and software feature the adaptability and capability for expansion, which will render them useful in years to come. Finally, as educators, we must look beyond technological developments and monetary considerations to the impact of technology as it influences human development.

II. COMPUTER LITERACY GOAL AND DEFINITION

GOAL

A COMMAND OF THE SKILLS THAT CONSTITUTE MATHEMATICAL, SCIENTIFIC, AND TECHNOLOGICAL LITERACY.

DEFINITION

COMPUTER LITERACY -- AN ACQUIRED KNOWLEDGE OF COMPUTERS AND AN UNDERSTANDING OF THE SOCIAL IMPLICATIONS OF THAT KNOWLEDGE; AND THE ABILITY TO APPLY SKILLS IN COMMUNICATING WITH COMPUTERS.

III. DESIRED LEARNING OUTCOMES

Based on the adopted definition of computer literacy, the following program and terminal objectives have been identified:

PROGRAM OBJECTIVES

1. To develop student knowledge of computer concepts and personal and social impacts of computers
2. To develop student skills in evaluating the advantages and disadvantages of using computers for selected applications
3. To develop student ability to utilize the computer as an instructional medium in the acquisition of subject-area skills
4. To develop student skills in using the computer as an instrument for analysis and for problem solving
5. To develop student skills in writing computer programs
6. To develop increased student independence in the learning process, utilizing computer-assisted instruction.

TERMINAL OBJECTIVES

The learner will be able to:

1. Describe ways in which computers assist individuals
2. Identify major components of a computer system
3. Describe the basic operation of a computer
4. Describe the three basic functions of most computers
5. Describe types of problems that can be solved by computers
6. Describe limitations of computers
7. Identify and diagram the sequence of steps in solving a problem
8. Execute the sequence of steps in solving a problem using a computer
9. Use the computer for problem solving, retrieving information, demonstrating relationships, and drill and practice; as a tutor; and in instructional games, simulations and exploration

10. Design a simple program using a specified computer language

11. Demonstrate a positive attitude toward the personal use of computers as well as toward computers as a social force.

These objectives reflect three categories of use — the computer as: 1) an object of instruction, 2) a vehicle of instruction, and 3) as a support tool for instruction.

RECOMMENDATIONS

- That the computer literacy definition be adopted as stated
- That the program objectives and terminal objectives be adopted as stated.

IV. INSTRUCTIONAL COMPUTING

Computer technology that seemed to be far, far away in another galaxy has suddenly made a quantum leap into the here and now in the District of Columbia Public Schools. It is now necessary to determine how to integrate computer literacy into the Competency-Based Curriculum in all appropriate subject areas and on all levels. To accomplish this, the committee considered needed policies, reviewed the research, discussed the advantages and disadvantages of developing or acquiring software, explored practices for facilitating and monitoring instructional computing, and discussed priorities for which software will be used.

COMPUTER LITERACY INSTRUCTION

Computer literacy should be integrated into the instructional program at appropriate points in grades one through eight. Numerous lists of computer literacy objectives reflected in the literature have been summarized as follows:

- State the three characteristics of most computers as being able to: (1) store and retrieve information, (2) control the operation of other machines and (3) quickly and accurately perform calculations/solve problems
- Name at least five careers related to the computer field and classify each career as being a part of either the design, production, or operation of a computer
- List three examples of computer output media and their related devices
- List two examples of computer auxiliary storage and their related devices
- Identify and name a random group of illustrations depicting various computer hardware equipment
- Identify one use of the computer in each of the following areas: business, medicine, education, law, transportation and fine arts
- Identify positive and negative effects of using the computer in one of the following areas: business, medicine, education, law, transportation, and fine arts
- Identify how the computer may be used in the future to benefit people.

There are other lists of computer literacy objectives with a broader definition including computer concepts, computer programming, and computer impacts which can be integrated into language arts, mathematics, social studies, and science at different levels of instruction.

Instructional objectives for computer literacy will be integrated into the present curriculum at the appropriate levels of instruction in grades one through eight. A matrix may be found on the following pages showing possible integration of computer literacy instructional objectives with mathematics, science, social studies and language arts.

COMPUTER SCIENCE

For grades 9-12, opportunities exist for students to enroll in a variety of computer science courses. A listing of current elective offerings at the secondary level taken from the SY 1981-82 Master Course List follows:

Mathematics

M38 Introduction To Computer Programming
Grades 10-12 .50 Units One Semester, Pre-Req: M21

M48 Introduction to FORTRAN Programming
Grades 10-12 1.00 Units One Year, Pre-Req: M38

M49 Introduction to COBAL Programming
Grades 10-12 1.00 Units One Year, Pre-Req: M38

M59 Computer Mathematics
Grades 11-12 1.00 Units One Year, Pre-Req: M41

M68 Advanced Computer Concepts
Grade 12 1.00 Units One Year, Pre-Req: M58

M58 Assembly Language Coding
Grades 11-12 1.00 Units One Year, Pre-Req: M48 or M49

Business

B85 Computer Technology
Grades 10-12 1.00 Units One Year, Pre-Req: None

B86 Data Processing (Introduction)
Grades 11-12 .50 Units One Semester, Pre-Req: None

B87 Data Processing I (Concepts and Keyboarding)
Grade 12 .50 Units One Semester, Pre-Req: None

B73 Word Processing I
Grades 11-12 1.00 Units One Year, Pre-Req: B25 or B26 & B43

B74 Word Processing II
Grade 12 1.00 Units One Year, Pre-Req: B73

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES K-2

INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS			
	MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
1. Develop logically sequenced steps needed to perform simple tasks.	X	X		
2. Describe a sequence of steps needed to perform a simple task.				X
3. Draw diagrams using simple geometric figures to show a sequence of steps needed to perform simple tasks.	X			
4. Execute a sequence of steps to perform a simple task.	X	X	X	X
5. Execute a sequence of steps which requires the learner to choose the next step or sequence of steps.	X	X		
6. Demonstrate more than one way to complete a simple task.	X	X		
7. Identify errors in a set of steps given orally, written or demonstrated for completing a simple task.	X	X	X	X
8. Predict what will happen if one or more steps in a given sequence are changed or deleted.	X	X		X
9. Demonstrate the ability to operate a computer and related electronic devices.	X	X		X
10. Use the computer to run programs, to engage in activites such as games, printing, construction of graphic designs, etc.	X	X	X	X
11. Follow instructions for properly using and operating the computer.	X	X		
12. Select computer programs by name and recognize that the computer must be instructed to perform tasks by way of a program.		X		
13. Identify institutions in the community that use computers.			X	
14. Describe everyday applications of computers in the community.				X

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES K-2

INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS			
	MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
15. Use appropriate vocabulary to refer to the computer and computer related apparatus and activities.	X	X		X
16. Read stores, poems, books and other printed materials related to the computer.			X	
17. Write stories about computers and computer related activitives.				X
18. Identify the difference between batch mode and interactive mode computer processing.				X
19. Describe computer advantages and disadvantages.				X

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES 3-4

INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS			
	MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
1. Develop logically sequenced steps for solving problems in mathematics.	X			
2. Describe the logically sequenced steps used to perform a task.	X	X	X	X
3. Develop steps for performing given tasks.	X	X	X	X
4. Identify and correct errors in a given sequence of steps that requires decision making in performing a given task.	X	X	X	X
5. Develop algorithms for accomplishing tasks that include conditions which require decisions.	X	X		
6. Interpret and use computer program documentation.	X	X	X	X
7. Select and use programs given program documentation for aid in performing a given task.	X	X		
8. Describe the uses of computers in society.			X	
9. Distinguish between the capabilities of real computers and computers described in fiction.				X
10. Identify the kinds of information stored by the computer.	X	X		
11. Describe the kinds of information the computer provides schools, banks, businesses, etc.				X
12. Use appropriate vocabulary related to the computer.	X	X		X
13. Read/discuss literature related to the computer.				X
14. View and discuss films which include computer related information.				X
15. Identify the major components of a computer (input, control, memory, processing, and output).				X

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES 5-6

INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS			
	MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
1. Compare manually executed and computer executed steps in performing tasks.	X	X		
2. Identify the steps for solving given problems.	X	X		
3. Recognize and organize relevant data needed to analyze or solve problems.	X	X	X	
4. Use computer simulations as aids for solving problems, and for instruction.	X	X		
5. Use computer data bases to retrieve information.	X	X		
6. State examples of tasks which the computer performs and explain the advantages of having the computer perform these tasks.	X	X		
7. Describe ways the computer is used in society.				X
8. Describe how data is stored in the computer and retrieved.	X	X		X
9. Describe restrictions and controls that are needed to protect individual privacy and rights.			X	X
10. Identify standard flow chart symbols and state their meaning and uses.	X	X		
11. Develop logically sequenced steps needed to solve given problems.	X	X		
12. Construct flow charts for sequence of steps used to solve given problems.	X	X		
13. Write computer programs using the language BASIC from given flow chart statements.	X	X		

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES 5-6

INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS			
	MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
14. Test computer programs for correct solution, identify and correct errors if they exist in the program.	X	X		
15. Describe the major components of a computer (input, control, memory, processing, and output).		X		
16. State at least three characteristics of a computer.		X		
17. Describe the basic operations of a computer.		X		X
18. State ways that scientists use computers.	X	X		
19. Describe major historical events in the development of computers.			X	X
20. Identify and compare computer related occupations and careers.			X	X

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES 7-8

	INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
1.	Develop different strategies and modes for solving given problems.	X	X	X	X
2.	Use word processing programs to aid in writing compositions.				X
3.	Describe the use and impact of word processing.			X	X
4.	Describe how word processing is used in careers related to writing and reporting.				X
5.	Describe ways that scientists use computers.		X		X
6.	Describe ways that large organizations use computers and the kinds of data they process.		X	X	
7.	Define and use appropriate vocabulary related to computers and computer systems.	X	X		X
8.	Identify and analyze computer related issues in society.			X	
9.	Identify and describe factors which contribute to the increasing utilization of computers.			X	X
10.	Describe ways in which computers may adversely affect people.		X		X
11.	Identify and describe computer related skills needed in careers directly and indirectly related to the computer.			X	X
12.	Use specific procedures for developing programs to solve given problems.	X	X		
13.	Write well-organized programs using BASIC language.	X	X		

COMPUTER LITERACY PROGRAM

ENTRY LEVEL GRADES 7-8

INSTRUCTIONAL OBJECTIVES	SUBJECT AREAS			
	MATH	SCIENCE	SOCIAL STUDIES	LANGUAGE ARTS
14. Test and correct programs using error messages.	X	X		
15. Provide documentation of programs.	X	X		
16. Demonstrate knowledge of the design and operation of available computer hardware.		X		

Students will apply previously acquired knowledge and skills in using the computer to solve appropriate problems in a variety of content areas.

Let us visualize various applications of computers in instruction by mentally walking through some classrooms in the D.C. Schools in the year 1987.....

> In an elementary school, the first grade students are learning to spell words correctly, and are becoming comfortable with the computer keyboard. Fourth grade students, two or three at a console, are composing a story to be published in the school newspaper. They can collaborate in this because all can read the monitor simultaneously. Fifth graders in the next room are using commercial software which graphically helps them to classify insects. This lesson also helps them understand that computers work on a binary number system.
>
> Meanwhile, in a junior high science class the students are feeding data about the use of heating oil and natural gas in American homes into a computer terminal. They expect to receive a cost analysis which will help them determine which fuel is the most economical in each of several types of home architecture.
>
> Across town, at a local high school, the English II students are taking a test with other English II students on a citywide basis because they have computer "on-line" capabilities. At the same time the students in "Science and Social Issues" are writing a program to be used in simulating population shifts in the United States. This program will be used to study an urban management issue which came out of a class discussion.
>
> In another section of the City, at Children's Hospital, a bed-ridden student is receiving regular classroom instruction using computer controlled interactive cable television. Student responses, communicated through the use of a light pen on the screen, are being carefully monitored by Visiting Instruction Services (VIS) personnel.

These are just a few examples of the ways in which computers can assist instruction and learning. The creative development of curriculum in every subject will bring even more diversity to the use of these sophisticated instruments.

POSSIBLE USES OF THE COMPUTER IN SPECIAL EDUCATION CLASSES

Initial efforts in the use of the computer in special education classes will be in the habilitative areas and facilitating communication for students with severe handicapping conditions, such as translation of written text to Braille for the visually impaired student, text-to-voice, or allowing a student to type into the computer and have it speak his words.

Another use of computers in special education programs is in individualized instruction for older students in vocational training areas. The self-pacing allowed by computer-assisted instruction should greatly facilitate the progress of these students through the programs and allow teachers to vary their instructional patterns.

Logistical assistance in the location of instructional media and materials will be added in the near future so that special education instructors will be able to locate instructional supplies and equipment associated with certain instructional objectives.

In special education there are many possibilities for computer use:

- Computer-assisted habilitative devices for specific handicapping conditions, such as automatic text-to-braille, voice-to-text, and text-to-speech
- Prevocational and vocational skills training programs
- Basic skills instruction of the student; student interaction with the computer; storage and retrieval of data on student responses in the areas of: reading, phonics, math, and perceptual skills
- Drill and Practice
- Enrichment - introduction of new materials and concepts; individualization
- Computer games - training for leisure time activity with severely handicapped
- Interaction with student in affective (behavioral skills) area.

RECOMMENDATIONS

Following are recommendations concerning instructional computing:

- That a scope and sequence for computer literacy be developed for students in grades 1-8, and implemented so that students can progress at their own rate through the sequence in conjunction with their progress in other subject areas
- That computer literacy be acquired by students in conjunction with the use of computers in their regular course work
- That special modules be developed for integration into the curriculum where needed and appropriate
- That the primary goals of computer-assisted instruction be to enable students to become proficient in problem solving and to acquire facility in constructing simulations
- That the use of computers for drill and practice, and tutorials for academic reinforcement and/or enrichment be on an "as needed" basis, rather than an end in and of itself
- That teams be established in each subject area to evaluate software and recommend appropriate instructional software materials
- That guidelines be developed for the selection of the school-based Computer Laboratory teacher

- That teachers selected to operate the school-based Computer Laboratory have Levels I and II Computer Literacy courses and a course entitled, "Computer Operations and Basic Maintenance" or their equivalent

- That every effort be made to secure qualified teachers to conduct the computer science courses

- That hardware and software be provided to accommodate identified educational needs of both regular and special populations

POLICY CONSIDERATIONS

The policy needs which have been identified include the following considerations:

- That student computer laboratories be established in all schools

- That computer literacy and software selection skills be required for all instructional personnel (teachers, supervisors, and administrators) as part of the 5 year recertification requirement

- That beginning with SY 1982-83 all new teachers (with exception of those with computer science training) be required to obtain computer literacy training before being granted permanent tenure

- That every student be required to demonstrate a command of the skills that constitute computer literacy before the completion of junior high school beginning with SY 1987-88.

V. SOFTWARE

A review of the current catalogues of computer software reflects an abundance of materials. However, most of these materials are designed to meet lower order instructional functions, namely, drill and practice and tutorial service. A limited amount of instructional materials is available for higher order activities involving problem solving, simulation and enrichment.

Further there are many materials available at the elementary level in the areas of reading, mathematics, and language arts while there is a dearth of materials appropriate for use in secondary school courses.

The insufficient quanity of materials to serve various subject areas at different levels of instruction is just one problem related to computer software. Another problem is the quality of the materials that are available. Much of the software is attractive, but lacks instructional merit. The general principle is caveat emptor - - let the buyer beware. Consequently, whether the school system designs, develops or selects software, criteria are necessary for determining whether or not the materials meet the educational needs, are appropriate to the learning situation, and accomplish the purpose intended. Thus, in reviewing software for school-based computers, the following must be considered:

- Goals of the school system
- Needs and interests of the students
- Curriculum
- Skills and interests of teachers
- Adaptability to equipment
- Funds

TYPES OF SOFTWARE

Various types of software can be used with school-based computers. Some of the types of software and subcategories of each which should be considered in reviewing and selecting software are shown below:

Operating Software

- Operating systems
- Language processors (compilers, interpreters, linkers, translators)
- Utility programs (editors, word processors, file handlers, etc.)
- Software needed to control special purpose hardware

Computer-Managed Instruction Software

- Software designed to generate and print reports
- Automated Instructional Management System (AIMS)
- Test-scoring software
- Software that will provide student evaluation and grouping data
- Software that will provide student evaluation and prescriptions
- Software that will measure teacher performance and provide statistical data
- Software that will be useful in determining how to adjust our educational programs to meet the changing trends

Computer-Assisted or Computer-Aided Instruction Software

- Drill and practice programs
- Tutorial programs
- Simulation programs
- Test preparation programs
- Programmed instruction courseware
- Educational games
- Programmed computer aids

Educational Support Software

- Authoring languages/systems
- Educational guidance information systems
- College and scholarship aid searching programs
- Career investigation, guidance, planning and analysis programs
- Statistical programming and analysis programs

Local School Administrative Software

- Electronic Mail
- Text editors and word processors
- Attendance accounting software
- Grades management systems
- Budget control and analysis programs
- Automated procurement request programs
- Student scheduling and resource allocation programs
- Data-base management systems
  - Student data base
  - Educational software data base
  - Management services data base
- Information storage and retrieval

OBTAINING SOFTWARE

There are several sources from which software can be obtained. They include:

- Existing programs within the system
- Existing programs outside the system on an exchange basis
- Hardware vendors
- Educational software houses
- Consultants
- Teachers
- Students
- Programmers and software development specialists within the system
- Software clearinghouses

Descriptions of six of these categories follow:

Existing Program Software

Several programs within the city already have software which may be used. This software is primarily instructional software of the CAI and CMI variety and currently constitutes the bulk of the useable software. Many of the major elements of administrative software which consists of budget analysis and status programs, personnel management programs, data analysis programs and others are either available for use or are under development.

Software From Programs Already in Existence Outside of Our School System

A sizeable collection of software has been developed outside of the system. Usually this type of software was designed by the district using it or specially designed by someone for the district. If it has been around for some time, it may have been tested and evaluated. If it does not carry a copyright, it may be obtained for use free or for the exchange of some software which the system has or may develop. It may be necessary to modify this software so that it coincides with system goals and objectives.

Vendor Software

Vendor software is frequently very expensive. Every effort, therefore, should be made to obtain materials that have documented quality, can be duplicated without restrictions, and can be used with various types of hardware. Large quantity discounts should be utilized where possible.

Software From Educational Software Development Houses

Software from educational software houses is usually written to address specific needs and may require a license. This license can be very expensive, particularly if it is required that a license be obtained for each user of the software at each location.

Teacher/Student Written Software

Commercial and consortium sources provide a wide variety of courseware. In those cases when appropriate courseware is not available, teachers, students, and others may elect to develop their own courseware using authoring languages, authoring systems, or programming languages.

Consultant Written Software

Another means of producing couseware otherwise unavailable, is by consultant or contract. This avenue to courseware development may be appropriate when commercial and consortium sources are unable to meet current or projected needs and/or when teacher or student development is not feasible.

CLEARINGHOUSE PROCEDURES

Selection of computer software should begin with an assessment of the materials available. Such an assessment should include the following steps:

- Identify materials needed
- Obtain materials for review
- Review information obtained from the publisher

- Review data from users
- Evaluate the materials considering such factors as the following:

  - Grade level or ability level
  - Subject area
  - Specific topic(s)
  - Content
  - Instructional purpose(s)
  - Instructional objectives
  - Instructional techniques
  - Type of package
  - Technical quality
  - Producer
  - Quality documentation
  - Required hardware
  - Recordkeeping and reporting functions
  - Cost

This process of materials review and assessment may be facilitated by use of findings from national software clearinghouses such as the Far West Regional Laboratory, the Northwest Regional Laboratory and the Minnesota Educational Computing Consortion (MECC). These clearinghouses review software and publish their findings.

EVALUATION CRITERIA

Criteria for evaluation of software will be established by the Computer Software Committee after a careful review of evaluation guidelines available from the literature and users. Review of the materials will be made based upon the identified criteria and the documentation from the assessment will provide a permanent record that may be used by schools in selecting software.

DESIGN AND DEVELOPMENT OF MATERIALS

Publishers, equipment manufacturers, and others have computer software, however, educators may elect to develop materials that are tailored to their particular needs. When development is undertaken, consideration should be given to the five steps of the process which are design, develop, test, implement and evaluate.

RECOMMENDATIONS

- That a system for storing, cataloguing and locating software be established centrally and locally
- That a Computer Software Committee be established to assess software for program use
- That liaison with software clearinghouses be established and maintained
- That in-service training be provided teachers for evaluating, adapting, designing, and developing software
- That replacement costs of software be considered in long-term planning
- That software be adaptable to various hardware
- That the District of Columbia Public Schools establish affiliation with software clearinghouses such as the Far West Regional Laboratory, the Northwest Regional Laboratory and the Minnesota Educational Computing Consortium (MECC).

VI. HARDWARE

This chapter outlines the hardware deliberations of the Computer Literacy Planning Group and addresses several key factors in providing equipment for direct support of the educational program. The following were considerations in the planning effort:

- Over a five-year period, DCPS personnel will address many varied topics in the area of educational computing
- The computer configuration will reach many groups within the school system. Those groups are located in every geographic and organizational corner of the agency. Each group has slightly different expectations of computer support for their efforts
- Funding is currently available to place a large amount of equipment in schools, however, funding is insufficient to place a significant amount of equipment in each school. Thus, a carefully considered approach must be developed to phasing computer usage into the school program
- Finally, equipment decisions made today must be valid for several years. This is a difficult task considering the continually advancing state-of-the-art in computing.

Each of the above factors required compromise due to the impossibility of immediate placement of equipment in all schools to meet all expectations. Deliberations of the Computer Literacy Planning Group addressed this limitation. The group reached a consensus on a schedule of implementation. This schedule provides a logical approach to installing computer equipment parallel to the development of teacher, student and administrator skills.

The topic of hardware was considered in several steps.

1. First, a Statement of Objectives for the District's Computer Literacy effort was developed, encompassing a wide range of topics. Each topic, however, presents certain requirements for equipment to properly support the topic in the educational environment.
2. The Group examined computer literacy projects in other school districts. This provided an indication of the spectrum of computer requirements which can be anticipated in our program in the future. Some school districts also provided copies of their Requests for Proposals used in procuring computer equipment. The school systems represented took differing approaches to computer equipment in support of the educational program. This provided an opportunity to learn why various school systems have purchased micro-computers, minicomputers, and mainframe equipment.
3. The school system's current hardware inventory was examined with the thought that this inventory might be able to provide the foundation for equipment to service computer literacy.

4. Part of the hardware examination included seeking comment from outside parties, including a representative set of equipment vendors. The overall conclusion, however, was that our current holdings are so disparate and, for the most part, obsolete, as to hold little utility for supporting an effort which will run for the coming five years. Moreover, the amount of equipment currently on hand is small in comparison to the equipment investments which will be required to meet the programmatic expectations for computer literacy.

5. The Computer Literacy Planning Group also participated in direct discussions with several computer vendors representative of each major school of thought in computer hardware. This provided an opportunity to hear all sides of the micro - mini - mainframe controversy.

The product of the above research and deliberations is a set of capabilities and capacities which should be addressed in computer procurement for DCPS. We have chosen to state these as a series of questions which should be answered to elicit programmatic needs in a manner that can be translated into equipment needs.

The regulatory environment requires that a bid process take place in determining the final hardware solution. Due to the concurrent availability of funding, the hardware approach presented in this document was utilized as the basis for requests of vendors to bid on devices to best provide the required capabilities and capacities. The bid specifications are presented in the Volume II report.

Although the bid specifications are more detailed than this chapter, they present a generic approach to computer equipment. The Planning Group recognized that it did not know the product offerings of each manufacturer in detail. It was not possible, therefore, to ask for bids on "Brand X or similar" as has happened in other school systems.

The bid process thus presented a means of meeting City procedural requirements and providing an equitable forum for receiving external technical suggestions.

GENERAL REQUIREMENT AREAS

Following are the capabilities which computers must address in order to support the literacy effort and are presented as a list of general requirements which a variety of computers can meet.

Equipment requirements for computer "centers" are normally stated in a fashion that assumes procurement of one or a few computers and a limited number of attached devices. The overall final configuration -- in terms of numbers of devices and anticipated uses of those devices — is known in advance. The full scope of the Computer Literacy effort is not now known. Also, it will expand over time. Thus, hardware decisions made today must still be valid after at least three to five years.

The Hardware Sub-Group approached its task in a manner which takes into account changes in technology and in the school system's thrusts. This was accomplished through a generic approach to specifying computer requirements. It involved detailing the types and amounts of computer interaction which is expected by all equipment users under the Computer Literacy effort.

A review of computer literacy efforts nationally indicates that most computer interaction can be provided by a wide variety of vendors' devices. Further consideration of specialized computer uses will, therefore, be required. This consideration should include an analysis of whether the specialized uses are an overriding factor in the computer equipment for all components of the Computer Literacy Program. Alternatively, a separate procedure can be established to accommodate specialized computer uses which do not reach large numbers of students.

Here, then, is a starting list of areas of computer capability. Each area is applicable to the Computer Literacy Program now and in the future but the specific requirements within each area may change over time.

Number of Computer Stations and Locations

The term "station" or "work station" was chosen to identify each point at which computer usage will take place. This term accommodates many kinds of computers which might be used. By contrast, the terms "computer," "terminal" and "micro-computer," which are often seen and heard in computer literacy discussions, prejudice the final decision on purchases.

In determining the number of stations required to support the educational program, two basic questions must be answered: 1) how many people will use computers at any one time at any one location? and 2) how much time will each person require per week? These questions will impact greatly on cost since one computer work station can cost from a few hundred to many thousands of dollars.

Keyboard

There must be a means of communicating with each work station. Keyboards are the most common, yet some other means exist. In fact, alternative methods can provide better computer access for persons with certain handicapping conditions. Similarly, alternative means of communicating with the computer can be more effective in computer-assisted instruction (CAI). These specialized needs should be considered in developing a precise needs statement.

Display Screen

The keyboard, or other component, merely allows a person to "talk" to the computer. A further device is necesary for computer response to the person. Two overall possibilities exist: a device which consumes paper -- a "printer" -- or one which presents an image -- a display screen. The Planning Group determined that much output to the human operator does not require paper storage. Thus a display screen is necessary.

Furthermore, a display screen can often provide color and/or graphics capabilities more effectively and less expensively than a paper-based device. There was no clear consensus, however, on the need for either of these capabilities. They should, therefore, remain desirable features until DCPS has more experience in providing computer experiences within the educational program. It was noted, though, that color and graphics capabilities are gaining in use in business and industry.

Printer

Despite availability of a display screen, it might be desirable for some stations to have the capability of printing programs and results on paper.

Processing Power

Clearly, any computer equipment must have the ability to process computer programs for the Computer Literacy effort. How much power will any one person require at any one time? This can be measured in terms of how fast a response is required for a particular operation, such as performing part of a tutorial.

Memory

Each person using the equipment will require computer memory to hold programs while they operate. How much memory will each person require?

Program and Data Storage

Computer programs for the Computer Literacy effort require a device to store them when not in use. Also, storage is required for data that those programs use. How much storage is required for each typical user? How much storage is required for all users at any one site?

Software

The following topics address software -- the computer programs which must be purchased to enable proper operation of equipment. The term "software" differs in its use here from that elsewhere in this report. Here it refers only to general-purpose computer packages which computer manufacturers usually sell. Elsewhere in the Planning Group's report, "software" refers to programs and materials to support specific educational needs.

Operating System Software

Equipment purchased will require software to insure the proper and orderly operation of each work station. The operating software should be able to control and organize each person's use of a machine. How much control will DCPS users require? Should the control be exerted centrally? Regionally? At the local school level? Not at all?

Computer Language Software

Many stations will require access to program development software. This software will allow DCPS students and teachers to develop original computer programs. This provides a means of meeting specific computer processing needs and a means of developing skills in programming.

Which computer languages are most effective now? Are some languages more effective for some age groups than others? Are some languages more effective in first exposures to computers? Are some languages more effective in developing job market skills? Are some languages more effective in development of computer-assisted instruction?

Ability to Use Others' Program and Data

The Computer Literacy effort will involve many school system locations. Will these locations use a common set of computer programs? If so, the equipment must allow those programs and associated data to be shared. What security arrangements are necessary to preclude improper use of data?

Ability to Connect External Devices

Will some stations' work involve communications with devices other than keyboard, display screen and printer? If so, what kinds of devices are required? Additional operating system capabilities may be required if the additional equipment is to be used at the same time as the basic devices.

Compatability with Current Efforts

Does the Literacy effort plan to use computer programs currently in use here or elsewhere? If so, is the investment in these programs an overwhelming factor in predetermining some characteristics of the computer selected? Alternatively, can these programs function on several makes of computer?

Availability Requirements

This addresses the users' requirement to have working equipment most of the time. Specifically, how many hours per day must the equipment be available? When a portion of the equipment in a particular location breaks, how quickly must repairs be effected? Should replacement equipment be supplied when repairs will take longer? Will responsibility for replacement equipment lie with the vendor or with the school system? Further detail is provided in Chapter VII, "Maintenance."

Physical Security

What intrinsic features should the equipment and its supporting devices have in order to minimize theft and damage? How can security officers be notified when theft occurs? Can the computer equipment be a part of an alarm system?

Accessories

A final area for specification is the non-electronic equipment required to support computer usage. Schools, typically do not possess appropriate furniture on which to place computer equipment, sufficient electric outlets for connection of computer equipment and cabinets to hold reference materials related to computer usage. Sufficient copies of the reference materials themselves will also be required for operation of the first year effort. Training will be required in basic operation and care of equipment.

CLEARINGHOUSE

The above items address an approach to specifying equipment needs for the general purpose Computer Literacy effort. DCPS engages, however, in further educational thrusts which require computer equipment. These programs variously require general purpose equipment or, occasionally, specialized equipment. Unfortunately, imposition of a requirement that only one or a few computer models are allowed in DCPS can serve to thwart the viability of some educational programs.

Several school systems which were examined have taken an approach to this problem which implements a clearinghouse for computer requests. This can function as a second level of decision making beyond the program manager. Alternatively, a school system may approve several types of computers, as in a catalog, and allow administrators free choice thereafter. Finally, the clearinghouse procedure can operate as a cooperative arrangement, setting general guidelines for school computer procurement and participating in procurement decisions.

RECOMMENDATIONS

- That the technical specifications for hardware and software, and maintenance as outlined in Volumn II of this report be used as the basis for the acquisition of general purpose and specialized equipment for the computer literacy program
- That clearinghouse procedures be established for the assessment, review, and approval of computer equipment required for schools.

VII. MAINTENANCE

The design of the maintenance program includes the capability to conduct in-house preventive and repair maintenance, and contractual provisions for factory repair and/or replacement of hardware for extremely complex repair problems. The components of the maintenance program will be negotiated during the Invitation for Bid (IFB) process. The IFB process will embrace both hardware and maintenance and should address, in a comprehensive manner, such interrelated hardware and maintenance concerns as capability, compatability, practicality, reliability and cost-effectiveness. The final maintenance process will not be decided until bids are received and reviewed.

Moreover, research indicates that when one million dollars worth of hardware is purchased, the annual maintenance cost may amount to as much as two hundred thousand dollars or twenty percent of the original purchase price. First year costs may be lower than normal because the equipment is new and the warranty usually covers a part of the first year. Therefore, because of the highly complex circuitry of some hardware, a combination of in-house and vendor maintenance may be desirable.

IN-HOUSE MAINTENANCE

Organizing a maintenance program under the sponsorship of DCPS involves first year outlays that will need to be supplemented in subsequent years. Immediate needs will be an office to house staff and to stockpile spare parts and diagnostic equipment plus a mobile van to travel from the repair center to the schools. The van should be able to transport a full-time technician and two or three student trainees along with spare parts and diagnostic equipment. One or two mobile units will be required to support maintenance of the computers that will be installed over the five year period of implementation.

Previous experience with typewriters and refrigerators indicates that DCPS sponsorship of the maintenance program would be the most practical and cost-effective approach in the long term and that better results can be achieved by appropriately trained in-house personnel. Additional considerations for the repair center include:

- The center should have a service number for local school personnel to call if maintenance is required
- The center should be capable of responding to all callers within a three hour period
- The center should have the resources to visit the school within twenty-four hours of the request
- The center should be able to provide a replacement device if repair problems are extensive

- School personnel should be able to provide basic information on a maintenance call such as:

  . School, room number, contact person, and telephone number

  . Make, model, serial number of computer

  . General description of problem.

STUDENT TRAINING

In building the in-house maintenance program, the system has the opportunity to utilize valuable student resources while providing experience for them which may lead to viable employment opportunities. In designing such a training program, it is suggested that:

- A course or courses in computer maintenance and repair be established
- The course(s) incorporate classroom job-related instruction and on-the-job training experiences
- Prerequisites be identified
- A student/supervisor ratio be established.

MAINTENANCE PROVIDED BY VENDOR

Vendors who supply hardware must have the capability to provide cost-effective systemwide service for maintenance. Matters related to response time and price per visit should be measured against the cost and capability of providing such service in-house. In any event, the following contractual specifications will be requested:

- The listing of maintenance prices provided by the vendor shall include parts and labor, as well as, the use of equipment necessary for testing
- Equipment placed under maintenance contract shall be in good mechanical, electrical, and operating condition 95% of the time
- The contract should provide for "on call" maintenance service which will promptly (within two hours) dispatch an engineer to the location
- Computers that are "down" temporarily for any reason for more than one day should be replaced temporarily
- Regular preventive maintenance should be provided (including lubrication, adjustments, and replacement of worn parts)
- A per-call rate should be established, as well as, an overall rate regardless of the number of calls
- Local schools should be able to call for maintenance service between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday

- The maintenance contract should be for one year
- The contractor should provide technical assistance in moving equipment (disassembling, installing and testing) as requested
- Maintenance service should be provided anywhere within the District of Columbia city limits
- The vendor should provide a comprehensive training program for at least four DCPS repairpersons
- The vendor should provide a training manual to be used in the instructional program. The manual should set forth step-by-step procedures to be followed in instructional format, equipment necessary and prerequisite requirements, if any.

RECOMMENDATIONS

- That an in-house maintenance program be established and coordinated with other DCPS maintenance and repair operations
- That training for students in computer repair and maintenance be provided
- That arrangements be made for the security of computing equipment, proper wiring, furniture and mobility
- That potential public/private partnerships be explored with selected vendors for maintenance and repair of computer equipment
- That in-service training be provided to staff, for the maintenance and repair of equipment
- That contractual arrangements be made with the vendor to provide maintenance and repair services.

VIII. THE COMPUTER LITERACY TRAINING LABORATORY

The Computer Literacy Training Laboratory (CLTL) has as its major functions in-service training of instructional personnel, curriculum development, and technical assistance. The operational goals are:

- To conduct courses and workshops
- To provide software necessary to strengthen the instructional program in the schools
- To review and develop software which supports the Competency-Based Curriculum
- To assist in the maintenance and repair of equipment in the schools
- To maintain a resource center for computer-related materials
- To develop a Competency-Based Computer Literacy Curriculum which is integrated into the instructional program for grades 1-12
- To provide on-site instructional support to teachers and administrators relative to computer technology.

The Computer Literacy Training Laboratory, a centralized facility, will be housed at the Instructional Services Center and will serve as a training and program development center for teachers, administrators, and supervisors. The Laboratory will focus on "hands-on" training which is necessary for effective utilization of computers in the schools.

The objectives of the Computer Literacy Training Laboratory follow:

- To provide participants with programming skills necessary to understand appropriate uses of computers
- To acquaint participants with the historical and societal significance of computers
- To develop knowledge and skills in the uses of computers in the instructional program
- To develop knowledge and skills in the application of computers in education and instructional management
- To develop fundamental skills in the operation of computers
- To develop skills in the use, review, and development of software
- To develop skills in selecting hardware appropriate to individual school needs
- To relieve computer anxiety.

STAFFING

The staff for the Computer Literacy Training Laboratory will include the following positions:

• Assistant Director	ET-10
• Teacher Trainers (2)	ET-15
• Computer Programmer	DS-11
• Administrative Clerk	DS-06
• Clerk Typist	DS-04
• Repairman	RW-09
• Curriculum Developers	WAE

Job descriptions for the staff are contained in Chapter XII of this report.

IN-SERVICE TRAINING

Implementation of the training program for teachers, administrators, and supervisors will be accomplished through in-service courses and workshops. A listing of the proposed course titles follows:

- Computer Literacy
- Principles of Software Review
- Principles of Hardware Selection
- Advanced BASIC Programming
- Uses of Computers in Elementary Schools
- Uses of Computers in Secondary Schools
- Principles of Software Development in the Content Areas
- Computer Operations and Basic Maintenance
- Special Topics in Computer Education

The Computer Literacy course was offered to approximately 400 teachers, administrators and supervisors in the summer of 1982. This 50 hour course had the following objectives for participants:

- Read and write simple programs that work
- Describe briefly how computers work
- Name various events in the history of computers
- Critique software and courseware
- Describe a variety of ways computers impact on society
- List a variety of uses of computers in education and describe the benefits of each
- Use computer terminology
- Discuss the limitations and misuses of computers
- List careers which are computer related
- Be comfortable with computers.

The proposed in-service courses, including the basic Computer Literacy course, will be offered during SY 1982-83 for teachers, administrators, and supervisors.

The Computer Literacy Training Laboratory is designed to assist all instructional personnel in becoming computer literate in the next five years. An on-going evaluation of program objectives will be undertaken to assure a responsiveness to the developing needs of students, and instructional personnel while keeping pace with changing trends in computer technology.

RECOMMENDATIONS

- That a centralized Computer Literacy Training Laboratory be established
- That school personnel be encouraged to take advantage of the opportunity to participate in the Computer Literacy Training Laboratory courses
- That applications for other in-service computer courses be screened by the Computer Literacy Training Laboratory staff.

IX. EXISTING PROGRAMS

Numerous computer programs are in operation in the school system, but only a few involve multiple schools. Some programs were initiated by school system personnel, some by concerned parents and citizens while others were made available through outside support for pilot and/or demonstration purposes. The earliest successful program was the Ballou Senior High School computer facility. A description of this and other existing programs follow:

BALLOU HIGH SCHOOL COMPUTER PROGRAM

The Ballou High School Data Processing Training Program was established in 1970 to develop innovative curricula in data processing that could be used in inner city schools. Specifically developed to provide students with opportunities to attain marketable skills in data processing, the Ballou program also trains teachers in computer applications. Around this original thrust several programs/activities/services have been developed. They are:

- Computerized guidance available to all junior and senior high schools
- Computer programming available to all senior high schools
- CAI, CMI, simulations, test preparation, etc. available to all junior and senior high schools and some elementary schools
- Orientation sessions for site visitors and classes on field trips

A part of the Ballou Science-Mathematics High School program since 1975, the Ballou system serves a total student population in excess of 2000 using a PDP-11/44 minicomputer and 64 interactive terminal ports.

BELTWAY MICROCOMPUTER/VIDEODISC PROJECT

This technology project is part of a national pilot program sponsored by the U.S. Department of Education located at over 40 sites nationally and known locally as the Beltway Project. Begun in March 1981, with four participating elementary schools, the project expanded in SY 1981-82 to include a total of eight elementary schools, two in each region. Project schools provide the Education Department and the school system with an opportunity to study how advanced technology can be introduced into the school setting.

Equipment provided by the Education Department to each school on a long-term loan basis includes an interactive videodisc player, an Apple II, 48K, one disk drive/ controller, and a color TV monitor; additional materials are video game paddles, programming workbooks, videodiscs and microcomputer diskettes. Most student materials are aimed at the upper elementary grades.

All sites will be interconnected through acoustic modems by Fall 1982 and will be able to communicate through electronic mailbox techniques to all other sites.

The contractor, American Institutes for Reserach (AIR), provides training, limited maintenance and will conduct an evaluation of the demonstration, to include data on use and equipment maintenance, and case studies of the participating sites.

NSF SCIENCE PROGRAM

Begun in the summer of 1980 with a grant from the National Science Foundation, the NSF Program provided junior high school teachers with training, equipment and software for using computers for activities in science. Coordinated by the Instructional Services Center and in cooperation with the American University, approximately 50 teachers from thirteen junior high schools received training in BASIC language and simple programming in its two years of operation. At least one Atari 400 was placed in each of the participating schools.

THE AIMS PROGRAM

The Automated Instructional Management System (AIMS) is an instructional management system currently under development which is directed to the competency-based reading and mathematics curricula used in DCPS elementary schools. When fully operational, AIMS will have the capability of providing teachers with automated checklists for each child, classroom grouping reports, and finely tuned diagnostic information for each child at any time during the school year. Currently, eight elemen-tary schools - Amidon, Bryan, Meyer, McGogney, Nalle, Oyster, Shepherd and Slowe - participate in the project.

THE ANSWER TM

During SY 1979-80, Garfield school became a pilot site for a new instructional management system called THE ANSWER TM. Used in conjunction with the Houghton Mifflin Mathematics program, THE ANSWER TM provides prescriptions and/or evaluations based on test results for instruction. The system includes an automatic test scorer, a communications terminal, video display, keyboard, a micro processor, a high speed printer, and a storage disc.

Four additional elementary schools -- Draper, LaSalle, Murch and Shepherd -- have joined this pilot project since its inception.

THE ANSWER TM provides students with immediate feedback on their progress in mathematics; teachers with a scoring report for teacher-made tests and automated checklist reports on each child; administration with group and grade reports, and parents with specific information about the progress of children in mathematics.

CAREER CENTERS/HIGH SCHOOLS

The six career education centers offer a variety of courses and program offerings involving the use of computers. Word processing as applied to specific career fields is offered at M.M. Washington, Burdick, Chamberlain, and the Penn Center while computer-assisted instruction (CAI) is available at all career centers.

Beginning in 1975, the Burdick Career Center, in cooperation with the Department of Computer Science Technology, University of the District of Columbia, offers students from all over the city computer technology training leading to apprenticeships in: electronic data processing, systems analysis and design, applications and systems programming, data collection and conversion, customer engineering, computer programming, and system engineering.

The Banneker Senior High School computer-assisted instruction program was initiated in summer 1982. This program is designed to enable students to acquire basic computer literacy skills, access career guidance data files, develop independent study habits and skills essential to success in higher education, and meet an important requirement recently established by the College Board. The computer laboratory at Banneker is designed to provide an appropriate setting for all students to take the required CAI course at the sophomore level, beginning in Fall 1982.

Other high schools such as Dunbar, Eastern, and Wilson offer courses in data processing and/or computer mathematics. A full listing of computer courses currently offered is provided in Chapter IV, "Instructional Computing." Significant, new computer program offerings resulting from the public/private partnership program between the D.C. Public Schools, IBM, and Control Data Corporation are expected to be operational in SY 1982-83. Details on these programs are under development at this time.

THE TEACHER CENTER

Using a variety of computers and computer terminals, the Teacher Center has offered its 15 hour course, "Introduction of Computer Programming"; to teachers from D.C. elementary, junior high and senior high schools. Participants receive 6 hours of class instruction and 9 hours of hands-on experience with the computer. A course for approximately 80 participants was offered this summer.

COMPUTERONICS

Computeronics, a validated instructional program of the National Diffusion Network (NDN), will be installed in 23 District of Columbia Public Schools and several non-public schools involving all levels and regions. Funded by the District Facilitator Project, the Gifted and Talented Program and regular budget monies, this exemplary program addresses two basic thrusts: 1) problem solving with computers and 2) computers in society. A variety of computer hardware available in the schools will be used to offer the 35-40 hour course. The course has been used successfully with 5th - 8th graders.

X. IMPLICATIONS FOR FUTURE INTEGRATION OF COMPUTERS WITH OTHER INTERACTIVE TECHNOLOGIES

Any discussion of computers as an educational tool would not be complete without an overview of its relationship with other educational technologies. This chapter explores that relationship.

THE CABLE TELEVISION COMMUNICATIONS ACT OF 1981

The District of Columbia City Council is expected to pass cable television legislation. It is estimated that it will take two years from the award of a cable television franchise to its widespread availability. Legislation currently being considered mandates that ".... the Franchisee shall provide, without charge within the franchise territory, at least one (1) service outlet to each... public school building....". Various boards and commissions comprised of community leaders and technical experts will set standards and guidelines for use. The District of Columbia Public Schools, through the active efforts of the Board of Education, has sought membership on the Design Commission. Hopefully, at least three channels designated for educational use will be made available, as well as, several student training apprenticeships.

INTERACTIVE CABLE TELEVISION (CATV)

Cable television can provide a two-way interactive capability, promising exciting implications for management and instructional use. As an instructional tool, a teacher located in one school will be able to provide instruction to small groups of students located in other schools throughout the system. Homebound students could also tune in.

Similar interactive capability may be used by management. For example, the Superintendent could schedule systemwide meetings with local school and regional office administrators. Thus, cable television holds the potential to enhance future communications while reducing paperwork and travel expenses.

AUDIO/AUDIO-VISUAL TELECONFERENCING

Audio teleconferencing enables groups at one location to orally communicate with other groups, located anywhere in the world. While this technology is relatively inexpensive, it does not offer participants the opportunity to view the individual with whom they may be speaking. On the other hand, audio-visual teleconferencing allows the participants the opportunity to hear and see the other party.

The District of Columbia Public Schools is currently involved in teleconferencing through Project BEST (Basic Education Skills through Technology). This project, sponsored by the U.S. Department of Education, is designed to enhance the use of educational technologies by providing over 40 participating states an opportunity to share information.

ELECTRONIC MAIL

The blending of telephone technology and computer technology has resulted in the emergence of a system for producing and distributing printed text instantly; this system is referred to as Electronic Mail (EM).

Electronic Mail, as a means of sending and receiving short messages via the computer, will be implemented in all schools in SY 1982-83. With the anticipated core equipment in each building, it is feasible that the school system link-up with school sites locally and with other systems nationally via nationwide communication network.

VIDEODISC TECHNOLOGY

The videodisc is a 12-inch, record-like platter that can produce both sound and video on a television screen. The videodisc can store an enormous amount of audio, visual, and textual information-- 54,000 frames of information on each side. Information can be retrieved in a matter of seconds, viewed at variable speeds, forwards or backwards, or one frame at a time. When a videodisc player is linked to a computer, learning can be customized so that the viewer, typing in responses on the computer's keyboard, will see and hear only appropriate frames or sequences of frames on the disc.

OTHER USES OF INTERACTIVE TECHNOLOGY

Additional types of interactive technology include:

- Graphics Tablet - a device which makes it possible to place graphics easily on a computer screen, and to manipulate those graphics in special ways. Using the Graphics Tablet, students and teachers can explore computer animation with color; illustrate interactive computer stories, and incorporate detailed drawings into teacher generated lessons.

- The Black Box - an interface unit that allows the connection of card readers, serial line printers, dual cassette recorders, typewriters, carousel projectors and other equipment to produce programs that can be stored on a disc and used whenever needed. For example, using the carousel projector with the microcomputer, a multi-media presentation can be produced with pulsating movement and wired color along with special sound effects.

- Word processing - a service provided to offices which automates the preparation of documents and memos. Some systems even check the spelling of words. The original draft of a document is typed on a typewriter keyboard attached to a viewing screen. Letters are converted to digital form and stored on disc devices for instant retrieval and replay. Any portion of the document can be revised, deleted or added to produce a final copy. This service is available on almost all general purpose computers - micros, minis, and mainframes.

- Electronic Almanacs - an electronic library providing access to virtually any information currently available in libraries.

RECOMMENDATIONS

- That the District of Columbia Public Schools explore appropriate uses of interactive technologies

- That necessary equipment be provided to enable software developers to produce interactive videotapes and discs based on the Competency-Based Curriculum

- That an interactive television controller allowing for random access of videotapes and/or discs by a computer be an integral part of future equipment purchased for student laboratories in schools

- That the school system pursue membership on the District Government Cable Television Design Commission and the Public Access Board

- That the twelve schools with closed circuit television capabilities be considered as two-way telecommunication schools linked to the Presidential Building.

XI. INTERACTION OF COMPUTER LITERACY PROGRAM WITH OTHER GROUPS

The interaction committee feels that it is imperative that the suggested guidelines and resources of the D.C. Public Schools be disseminated to groups interested in computer literacy. The methods for imparting this information will be varied and should encompass the entire metropolitan area. Information should be provided to groups, such as the following:

- Parent Teachers Associations (PTA's)
- Home School Associations (HSA's)
- Volunteer Groups
- National Aeronautics and Space Administration (NASA)
- Universities
- Other Interested Persons/Groups

The mechanisms to disseminate the information may take one or all of the following forms:

- Newsletters
- Computer Fair
- Awareness Suggestions
- Computer Day Open House
- Press Releases
- Staff Development
- Internships
- Computer Clubs

RECOMMENDATIONS

- That informaton be disseminated about the Computer Literacy Program to targeted interest groups.
- That resources be sought from the private sector for support of the Computer Literacy Program.

XII. JOB DESCRIPTIONS

The position descriptions which follow have been requested in the FY 1983 budget for the Computer Literacy Program.

Position Title/Series/Grade: Assistant Director (I)
ET-10

Location: Instructional Services Center
Langdon Elementary School
20th & Franklin Streets, N.E.

Immediate Supervisor: Director, Instructional Services Center

Job Description:

1. Direct and supervise all functions related to the Computer Literacy Training Laboratory
2. Advise on trends in computer education
3. Assist with the development and coordination of computer literacy in-service education programs for school personnel
4. Develop a computer literacy course of study and provide instructional support
5. Assist with the dissemination of information relative to all aspects of computer literacy
6. Advise on the selection and purchase of computer software and hardware
7. Provide leadership in the development of appropriate computer software
8. Conduct performance appraisals for all personnel assigned to the Computer Literacy Training Laboratory
9. Prepare assessment reports relative to the program and services of the Computer Literacy Training Laboratory
10. Establish and maintain a schedule of computer literacy in-service activities at the Computer Literacy Training Laboratory
11. Assist with the coordination of computer literacy programs among the elementary, junior high and senior high school levels
12. Prepare and justify budget requests
13. Perform other duties as assigned.

Position Title/Series/Grade:	Teacher Trainer (2) ET-15
Location:	Instructional Services Center Langdon Elementary School 20th & Franklin Streets, N.E.
Immediate Supervisor:	Assistant Director, Computer Literacy Training Laboratory

Job Description:

The Computer Literacy Teacher Trainer will be assigned to the Instructional Services Center and will assume the following duties:

1. Serve as a resource person for computer literacy information and instructional materials
2. Assist with the operation of the Computer Literacy Training Laboratory
3. Plan and conduct, in-service education programs for school personnel
4. Provide on-site instructional support to teachers and administrators relative to computer literacy such as:
    - demonstrations
    - observations
    - establishment of local school computer laboratories
    - data analysis/interpretation
    - other
5. Plan and conduct computer literacy awareness sessions for parents and community
6. Assist with the development of a computer literacy curriculum and related computer courseware and software
7. Evaluate course materials and software for school use
8. Evaluate and recommend the limited use of new materials on an experimental basis
9. Establish and maintain a data bank of computer literacy resources
10. Perform other duties as assigned.

Position Title/Series/Grade: Computer Programmer (1)
DS-09

Location: Instructional Services Center
Langdon Elementary School
20th & Franklin Streets, N.E.

Immediate Supervisor: Assistant Director, Computer Literacy Training Laboratory

Job Description:

The Computer Programmer will be assigned to the Instructional Services Center and will assume the following duties:

1. Develop detailed programming plans, procedures, and approaches
2. Determine the programming methods and techniques to be used based on general flow charts which identify the nature of the work products desired, the major processing steps to be accomplished, and the relationship of inputs and outputs to other segments of the application
3. Devise methods of processing actions which entail substantial manipulation for resequencing of data elements in numerous discrete data formats
4. Assist school personnel to plan methods of obtaining input data, to resolve problems concerning output requirements, to develop control procedures to validate data
5. Plan the full range of programming actions and machine logic required by the laboratory
6. Analyze the relationship between various products desired
7. Establish various linkage points between routines and subroutines necessary to facilitate transfer of data
8. Check the accuracy of coded and compiled routines through spot checks, comparison with detailed flow charts, and by manual calculation
9. Participate in computer testing to evaluate program performance and adequacy of documentation
10. Evaluate alternative programming techniques, the nature and sequence of actions, and the number of passes required
11. Perform other duties as assigned.

Position Title/Series/Grade: Administrative Clerk (1)
DS-6

Location: Instructional Services Center
Langdon Elementary School
20th & Franklin Streets, N.E.

Immediate Supervisor: Assistant Director, Computer Literacy Training Laboratory

Job Description:

The Administrative Clerk will be assigned to the Instructional Services Center and will assume the following duties:

1. Serve as assistant to the Assistant Director, Computer Literacy Training Laboratory
2. Plan the internal methods and procedures to insure the smooth function of the office
3. Complete a variety of typing assignments which include general correspondence, statistical reports, charts, directives, manuals, curriculum and materials from rough drafts, notes or brief instructions from the Assistant Director, Director of the Instructional Services Center, and/or other staff personnel when the situation dictates
4. Organize and manage secretarial and specified administrative functions of the office
5. Proceed independently after initial assignments are made and demonstrate initiative
6. Compose correspondence and memoranda for the signature of the Assistant Director
7. Develop and apply clerical techniques and skills for the most advantageous and comprehensive presentation of information
8. Handle incoming telephone calls with courtesy, tact, and diplomacy
9. Assist with the collection of data, reference materials, and other information
10. Establish and maintain various records and files for the retention of general correspondence, memoranda, reports, and ready reference materials for the Computer Literacy Training Laboratory
11. Review and index all materials to be retained for ready access
12. Determine records to be retired on an annual basis and purge files of obsolete materials
13. Retain a copy of all printed matter prepared and distributed by the office

14. Order equipment and materials; purchase supplies for the office

15. Receive and review all incoming vouchers to insure that materials received conform to specifications listed on purchase orders

16. Set up and maintain the calendar of appointments for the Assistant Director

17. Perform other duties as assigned.

Position Title/Series/Grade:	Clerk-Typist (1) DS-4
Location:	Instructional Services Center Langdon Elementary School 20th & Franklin Streets, N.E.
Immediate Supervisor:	Assistant Director, Computer Literacy Training Laboratory

Job Description:

The Clerk-Typist will be assigned to the Instructional Services Center and will perform the following duties:

1. Serve as clerk-typist for the Computer Literacy Training Laboratory of the Instructional Services Center
2. Type correspondence, memoranda, reports, statistical tables, bulletins, notices, bibliographies, newsletters, and various other materials
3. Prepare from oral or written instructions correspondence such as letters concerning projects and programs, letters of transmittal, directives, reports, and other types of informational correspondence
4. Compose routine correspondence in reply to requests for information
5. Correct errors in grammar, syntax, punctuation, and capitalization where noted
6. Type statistical and other tabular work
7. Determine format for assigned reports
8. Respond to telephone inquires concerning the Computer Literacy Training Laboratory
9. Screen and answer inquires and determine referrals
10. Answer inquiries as accurately and factually as possible
11. Assist with the compilation of data pertaining to the Computer Literacy Program
12. Research existing files, Superintendent's directives and recommendations, previous annual reports, professional journals and reports, research findings, conference notes, other local school system reports, and any other available informational areas
13. Assist in the establishment and maintenance of the office files and the transfer of files to inactive status
14. Review before filing all correspondence, reports, and other materials for familiar and expeditious retrieval

15. Establish additional files as needed

16. Make appointments for the Assistant Director in the absence of the Administrative Clerk

17. Assist with the preparation of office requisitions

18. Assist with the maintenance of attendance records and the preparation of attendance reports

19. Prepare travel vouchers

20. Perform other duties as assigned.

Position Title/Series/Grade: CBC Curriculum Developer
ET-15
Temporary Appointment - Regular Budget

Location: Instructional Services Center
Langdon Elementary School
20th & Franklin Streets, N.E.

Immediate Supervisor: Director, Instructional Services Center

Job Description:

The CBC curriculum writers will be assigned to the Instructional Services Center and will assume the following duties:

1. Develop curriculum materials for computer literacy
2. Rewrite and revise curriculum materials as needed
3. Assist with orientation of teachers in the use of curriculum guides
4. Attend workshops and seminars pertinent to CBC curriculum
5. Assist with collection of data for validation of the curriculum
6. Assist with the puissance analysis of curriculum materials
7. Assist with reviewing of other curriculum materials to insure conformity of all materials with the CBC format
8. Recommend materials to be purchased for curriculum development
9. Devise ways and means of providing greater teacher input in the development and revision of curriculum materials
10. Assist with developing a resource center for computer-related materials
11. Provide technical assistance to teachers in developing computer-related instructional materials
12. Perform other duties as assigned.

Position Title/Series/Grade: Computer Repairman (1)
RW-09

Location: Instructional Services Center
Langdon Elementary School
20th & Franklin Streets, N.E.

Immediate Supervisor: Assistant Director, Computer Literacy Training Laboratory

Job Description:

The computer repairman will be assigned to the Instructional Services Center and will perform the following duties:

1. Repair and adjust computer, television, and audio and video tape recorders
2. Operate electronic test equipment which includes audio oscillator, battery eliminator or direct current converter, oscilloscope, and signal generator
3. Perform electronic work in the laboratory, schools, and administrative offices
4. Apply electronic theory, principles of electrical circuits, electrical testing procedures, engineering, mathematics, physics, and related knowledge to lay-out, test, trouble shoot, repair, and modify developmental and production electronic equipment such as computers
5. Examine newly installed equipment to evaluate system under actual operating conditions
6. Maintain an inventory of spare parts
7. Record man-hours spent and parts used on each piece of equipment
8. Maintain a record of all equipment stored in the computer/television repair room
9. Instruct and supervise lower grade technical personnel
10. May work from ladders, scaffolding, and platforms where system parts are difficult to reach
11. May lift and carry equipment weighing in excess of fifty pounds
12. Assure that computer terminals and/or micro computers within the system are working properly
13. Coordinate activities with other repair and maintenance operations
14. Perform other duties as assigned.

XIV. POLICY CONSIDERATIONS

The policy needs which have been identified include the following considerations:

- That student computer laboratories be established in all schools
- That computer literacy and software selection skills be required for all instructional personnel (teachers, supervisors, and administrators) as part of the 5 year recertification requirement
- That beginning with SY 1982-83 all new teachers (with exception of those with computer science training) be required to obtain computer literacy training before being granted permanent tenure
- That every student be required to demonstrate a command of the skills that constitute computer literacy before the completion of junior high school beginning with SY 1987-88.

XV. RECOMMENDATIONS

Recommendations of the Computer Literacy Planning Group are listed below:

- That the computer literacy definition be adopted as stated
- That the program objectives and terminal objectives be adopted as stated
- That a scope and sequence for computer literacy be developed for students in grades 1-8, and implemented so that students can progress at their own rate through the sequence in conjunction with their progress in other subject areas
- That computer literacy be acquired by students in conjunction with the use of computers in their regular course work
- That special modules be developed for integration into the curriculum where needed and appropriate
- That the primary goals of computer-assisted instruction be to enable students to become proficient in problem solving and to acquire facility in constructing simulations
- That the use of computers for drill and practice, and tutorials for academic reinforcement and/or enrichment be on an "as needed" basis, rather than an end in and of itself
- That teams be established in each subject area to evaluate software and recommend appropriate instructional software materials
- That guidelines be developed for the selection of the school-based Computer Laboratory teacher
- That teachers selected to operate the school-based Computer Laboratory have Levels I and II Computer Literacy courses and a course entitled, "Computer Operations and Basic Maintenance" or their equivalent
- That every effort be made to secure qualified teachers to conduct the computer science courses
- That hardware and software be provided to accommodate identified educational needs of both regular and special populations
- That a system for storing, cataloguing and locating software be established centrally and locally
- That a Computer Software Committee be established to assess software for program use

- That liaison with software clearinghouses be established and maintained
- That in-service training be provided teachers for evaluating, adapting, designing, and developing software
- That replacement costs of software be considered in long-term planning
- That software be adaptable to various hardware
- That the District of Columbia Public Schools establish affiliation with software clearinghouses such as the Far West Regional Laboratory, the Northwest Regional Laboratory and the Minnesota Educational Computing Consortium (MECC)
- That the technical specifications for hardware and software, and maintenance as outlined in Volumn II of this report be used as the basis for the acquisition of general purpose and specialized equipment for the computer literacy program
- That clearinghouse procedures be established for the assessment, review, and approval of computer equipment required for schools
- That an in-house maintenance program be established and coordinated with other DCPS maintenance and repair operations
- That training for students in computer repair and maintenance be provided
- That arrangements be made for the security of computing equipment, proper wiring, furniture and mobility
- That potential public/private partnerships be explored with selected vendors for maintenance and repair of computer equipment
- That in-service training be provided to staff, for the maintenance and repair of equipment
- That contractual arrangements be made with the vendor to provide maintenance and repair services
- That a centralized Computer Literacy Training Laboratory be established
- That school personnel be encouraged to take advantage of the opportunity to participate in the Computer Literacy Training Laboratory courses
- That applications for other in-service computer courses be screened by the Computer Literacy Training Laboratory staff
- That the District of Columbia Public Schools explore appropriate uses of interactive technologies
- That necessary equipment be provided to enable software developers to produce interactive videotapes and discs based on the Competency-Based Curriculum

- That an interactive television controller allowing for random access of video-tapes and/or discs by a computer be an integral part of future equipment purchased for student laboratories in schools

- That the school system pursue membership on the District Government Cable Television Design Commission and the Public Access Board

- That the twelve schools with closed circuit television capabilities be considered as two-way telecommunication schools linked to the Presidential Building

- That informaton be disseminated about the Computer Literacy Program to targeted interest groups

- That resources be sought from the private sector for support of the Computer Literacy Program.